Note: Syllabus will be updated for fall 2015

Fall 2014: BIOC/NEUR 385, BIOC 585 Fundamentals of Neuroscience

Learning Goals

My goals for this course are to have you learn structures and functions of neurons and neural systems, to learn valuable skills, strategies, and ways of thinking that are particularly relevant to the study of neuroscience, and perhaps most important of all, to enjoy learning neuroscience. Below are the major learning objectives for the course.

- Be able to exercise critical thinking and common sense while applying basic principles of electricity and chemistry/physics of molecules to questions, quantitative problems, and semi-quantitative problems in neuroscience.
- Be able to apply historically important experimental strategies and models to new questions and problems in neuroscience.
- Be able to explain the structures and functions of components of the vertebrate nervous system, and how they interact to receive and transmit information
- Be able to cite and explain the physical basis for mechanisms that support learning and memory
- Be able to explain how neural information is encoded, organized, and processed by the brain in support of sensory perception and motor control

I will do the best that I can to help you accomplish two more important goals before the end of the course.

- Develop the desire to continue learning about cellular, molecular, and integrative neuroscience.
- Develop the confidence with which to pursue even the most difficult questions related to neuroscience.

To get the most out of Bioc 385 please heed the recommendations in the study guides, posted in Resources. I very much hope that this will be your favorite course at Rice.

Enjoy!

David R. Caprette
Professor in the Practice and
Instructor, Fundamentals of Neuroscience

Syllabus for fall 2014

All of this information except for recommended texts is subject to change prior to the start of classes.

Meetings

MWF 10-10:50 am, location TBA

Instructor

David Caprette, caprette@rice.edu, ABL 327, x3498; office hours 11 AM - 1 PM Mon, Tues, Thurs. I will be happy to make separate appointments for individuals who cannot come in during office hours.

iClickers

You will need a working iClicker+ handset for the first day. The Campus Store will stock them, but please see the Resources for a pdf listing other purchase options.

Recommended texts

The first study guide explains the rationale behind the selection of recommended materials.

- Purves, D (ed.), Neuroscience 5th edition, Sunderland, Mass: Sinauer Associates, inc., 2012, ISBN 978-0-87893-695-3 (STRONGLY RECOMMENDED)
- Nicholls, JG (ed.) From Neuron to Brain 5th ed., Sinauer Associates, inc., 2012, ISBN 978-0-87893-609-0 (RECOMMENDED).
- Kandel, ER (ed.) Principles of Neural Science 4th ed., 2000 (RECOMMENDED).

Resources

- For each class: Powerpoint slides w/notes and questions to consider (in Resources folder: Presentations_fall_2014).
- For each exam period (3 total): one study guide, one set of study questions
- There will be a practice test (graded) prior to the first exam
- Throughout the course: reference materials on electricity, links to video clips and journal articles
- Keys to study questions, homework sets, and exams

Course grade

Final course score will be determined from classroom attendance and clicker questions (5%), homework sets (30%), mid-term exams (20% each), and a final exam (25%). Students in Bioc 585 will write a five page paper on a topic chosen by student and instructor.

Course policies

Attendance and clickers. Each student is expected to come to each class with a working i>clicker and extra batteries. The attendance score will be based on percent questions answered (not necessarily correctly) per day, excluding the first week of classes and exam days. Each day I will score 5 pts for answering all questions, 3 pts for answering at least 50% of them, and 0 pts for answering less than 50% of them. Examples: skip class, forget the clicker, or come late and fail to submit an answer for 2 of 3 questions, lose all 5 points; arrive late and fail to answer 1 of three questions, earn 3 points out of 5.

Excused absences. As with all of my classes, I excuse absences due to circumstances beyond your control including illness, family matters, unavoidable travel obligations, etc. I may or may not require documentation.

Homework assignments. Printed single-sided copies of homework assignments will be due in class. Please print your student ID (S followed by an 8 digit number) on all homework assignments and exams. Do not write your name on them. I am not consciously biased when I grade assignments. All the same, identifying assignments with an ID number ensures that there will be no unconscious bias either.

Late assignments. An assignment not turned in loses 10% of the total possible score and an additional 10% for each 24 hour period following the class in which it was due, weekends and holidays included. I cannot offer extensions, because I must be able to post the homework key in advance of the exam.

Exams. Exams will be held in class. You must contact me prior to any exam if you have an excused absence and will be unable to attend on the scheduled exam date. I can arrange to have you take the exam at an earlier time. I cannot reschedule an exam because you have an exam or a major assignment due in another course on the same day, nor can I give exams after the regularly scheduled time. In the event of illness I will need documentation as explained above. If you miss an exam, and due to circumstances beyond your control you cannot notify me in advance, then you must provide documentation in order to make up the credit. At my discretion I will replace the missed exam with an additional assignment (possibly a different exam) or simply not include the missed exam in determining your final course grade.

Exam feedback. I do not use "exam graders." I read through all exams once and mark tentative scores, then go back and re-check all questions to ensure consistency and fairness. Therefore there will be no need for "regrades" of exams. Your score will be posted in the Gradebook and your exam will be available during office hours or by appointment for you to look over. I cannot return exams or post keys.

Course grade

The final grade will be based on a straight percentage (no curve).

A+, 97 and up	A, 93-97	A-, 90-93
B+, 87-90	B, 83-87	B-, 80-83
C+, 77-80	C, 73-77	C-, 70-73
D+, 67-70	D, 63-67	D-, 60-63
F, below 60		

Topics and graded assignments

Please see study_guide1.pdf for required and recommended readings, supplemental resources, and objectives, questions, and problems to keep in mind while we discuss each topic.

The following schedule may change depending on the pace at which we make it through the topics.

Monday 25 Aug – Course introduction; Biological basis of behavior (01_F13_intro.pdf)
Wednesday 27 Aug – Animal electricity (02_anim_elec.pdf)
Friday 29 Aug – Testing the Bernstein hypothesis (03_testing.pdf)

Monday 1 Sep LABOR DAY

Wednesday 3 Sep – Discovering the diffusion potential (04_discovering.pdf)
Friday 5 Sep – Ionic basis of an action potential (05_ionic_basis.pdf)

Monday 8 Sep Conduction of the nerve impulse (06_conduction.pdf)
Wednesday 10 Sep – Channel function (07_chan_func.pdf)
Friday 12 Sep – Workshop on study questions

Monday 15 Sep –Studying channel structure (08_chan_struct.pdf)
Wednesday 17 Sep – previous topic continued
Friday 19 Sep – A diversity of ion channels (09_chan_diversity.pdf)

Friday 19 Sep – HW set #1 due in class

Monday 22 Sep – Introduction to synaptic transmission (10_syntran.pdf)
Wednesday 24 Sep – Pre-synaptic mechanisms: role of calcium ions (11_presynCa.pdf)

Friday 26 Sep – Midterm exam 1 – in class – will cover material up to and including channel diversity

Monday 29 Sep – Quantal release and the vesicle hypothesis (12_vesicle_hyp.pdf)
Wednesday 1 Oct – previous topic continued
Friday 3 Oct – Postsynaptic membrane potentials (13_postsyn.pdf)

Monday 6 Oct – Short term synaptic plasticity (14_STsynplast.pdf)
Wednesday 8 Oct – Synaptic plasticity in *Aplysia* (15_aplysia.pdf)
Friday- 10 Oct – previous topic continued

Monday & Tuesday 13-14 Oct **MIDTERM RECESS (NO CLASSES)**

Wednesday 15 Oct – Long term synaptic plasticity (16_LTsynplast.pdf)
Friday 17 Oct – previous topic continued

Monday 20 Oct – Somatosensory system (17_somatosensory.pdf)
Wednesday 22 Oct – previous topic continued
Friday 24 Oct – Proprioception (18_proprioception.pdf)

Friday 24 Oct – HW set #2 due in class

Monday 27 Oct – Detecting auditory signals (19_hearing1.pdf)
Wednesday 29 Oct – previous topic continued

Friday 31 Oct – Midterm exam 2 – in class – will cover synaptic transmission through proprioception – no material on hearing

Monday - Friday 3-7 Nov – Encoding auditory signals (20_hearing2.pdf)

Monday 10 Nov – Vestibular system (21_vestibular.pdf)
Wednesday 12 Nov thru Wednesday 19 Nov – Vision (22_vision.pdf, 23_vision2.pdf, 24_vision3.pdf)
Friday 21-Nov – Pain and temperature detection/perception (25_pain.pdf)

Monday 24 Nov – Chemical senses (26_chem_senses.pdf)
Wednesday 26 Nov – OPTIONAL REVIEW SESSION

Thursday-Friday 27-28 Nov **THANKSGIVING BREAK**

Monday 1 Dec – Motor control - motor cortex (27_movement1.pdf)
Wednesday 3 Dec – Motor control - basal ganglia (28_movement2.pdf)
Friday 5 Dec – Motor control - cerebellum (29_movement3.pdf)

Friday 5 Dec – HW set #3 due in class

Final exam TBA

The exam will cover new material, namely hearing, vestibular, vision, pain and temperature, chemical senses, and motor control. Some case studies may require skills/knowledge related to previous topics but will not focus specifically on previous topics. The length will be similar to that of mid-term exams, perhaps a question or two longer.

Students with disabilities

Any student with a disability needing academic adjustments or accommodations should contact me (x3498) as soon as possible and also contact Disabled Student Services in the Ley Student Center.